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FY 94 ANNUAL GROWTH POLICY

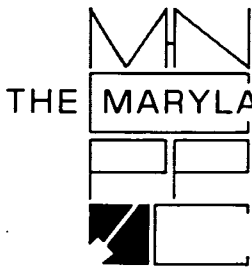
AMENDMENT

March 17, 1994

Recommendations for Amending
the Methodology for
Determining the Adequacy
of Transportation Facilities

FINAL DRAFT





THE MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION

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Montgomery County Planning Board
Office of the Chairman

March 31, 1994

The Honorable Neal Potter
Montgomery County Executive
Executive Office Building
101 Monroe Street
Rockville, Maryland 20850

The Honorable William E. Hanna, Jr.
President
Montgomery County Council
Stella B. Werner Council Office Building
100 Maryland Avenue
Rockville, Maryland 20850

Dear Mr. Potter and Mr. Hanna:

I am pleased to transmit to you the Planning Board's recommended amendments to the FY94 Annual Growth Policy. These amendments address the transportation adequacy methodology concerns raised by the County Council during its worksessions on the FY94 AGP last summer.

The Board believes these amendments, if adopted, will improve the AGP's transportation tests through increased sensitivity to the availability of transit and by testing the County's freeways as a single network, rather than on a policy-area-by-policy-area basis.

As you are aware, the current method for setting staging ceilings has been criticized for giving too much weight to freeway traffic. Policy areas with relatively uncongested local streets have suggested that their staging ceilings have been kept artificially low because of through traffic on freeways. Conversely, others have argued that freeway widenings in their policy areas have not reduced local congestion appreciably, but have resulted in substantial gains in staging ceiling anyway.

The Planning Board's recommended approach would no longer assign freeway segments to adjoining policy areas, but would instead set a congestion standard for the freeway network as a whole. The Board believes that this methodology will allow the County to continue to test the adequacy of the freeway system while permitting some additional development in policy areas where there is capacity on the local roads.

A second criticism of the current method for setting staging ceilings targets the "group" system for measuring transit availability. It has been argued that the scale of transit improvements required to change to a higher transit group is so large that more modest improvements are discouraged. The Planning Board is recommending that transit availability and use continue to be measured each year, but without the final step of assigning each area to a "group." Instead, the measurement of each policy area's transit availability and usage would be used to calculate how much roadway congestion could be permitted, and by extension, how much staging ceiling to allocate to that policy area.

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March 31, 1994

The recommended policy changes affect the way staging ceilings are calculated and would result in revised staging ceilings for some policy areas. The Planning Board's recommendations would add about 19,000 jobs and 24,000 housing units to the FY95 Draft Net Staging Ceilings, although some of the new capacity would be applied toward capacity deficits in moratorium areas.

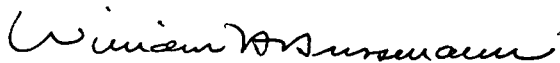
The Planning Board also has four recommendations that would make Local Area Transportation Review more sensitive to non-auto modes of travel. These include setting standards for adequacy for non-auto modes of travel and for giving credit in LATR for development located close to transit centers.

A continuing concern of the Board is the cumulative impact on the community of road and intersections improved to meet AGP requirements. The Board noted that in some cases, road and intersection improvements designed to relieve traffic congestion can result in roads that are out of character for the neighborhood and intersections that are difficult and dangerous for pedestrians. The Board's concerns are reflected in its recommendation to permit developers to meet some Local Area Transportation Review (LATR) requirements by making improvements to the pedestrian network. The Board recognizes that sidewalks and bus shelters will not necessarily remove a specified number of peak-hour trips from the roadways but nevertheless believes that the overall transportation benefit of the improvements justifies this provision.

One of the methods recommended by the Planning Board to increase the AGP's sensitivity to non-auto modes of travel is to permit greater intersection congestion in policy areas with greater transit availability. The Board recognizes that a drawback to measuring transit availability on a policy area basis is that transit availability can vary from community to community within the same policy area. There is a concern that the same amount of congestion is permitted in communities with less transit service than in neighboring communities within the same policy area. However, the Board does not believe that the variance is sufficient to warrant testing transit availability on a smaller than policy area basis.

The Planning Board is transmitting these recommendations now and the FY95 Final Draft AGP by May 1 so that both will be on the same "track" for County Council public hearings in June and action by July 15. As always, the Planning Board looks forward to working with both the Executive and the Council on these important issues and will be available when needed.

Sincerely,



William H. Hussmann
Chairman

Attachment

WHH:KWM

PLANNING BOARD (FINAL) DRAFT
AMENDMENT TO THE FY94 ANNUAL GROWTH POLICY

Recommendations for
Amending the Methodology for Determining
the Adequacy of Transportation Facilities

THE MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION
Montgomery County Planning Board
8787 Georgia Avenue
Silver Spring, Maryland 20910-3760
March 17, 1994

ABSTRACT

TITLE: FY94 Annual Growth Policy Amendment: Recommendations for Amending the Methodology for Determining the Adequacy of Transportation Facilities, Planning Board (Final) Draft

AUTHOR: The Maryland-National Capital Park and Planning Commission, Montgomery County Planning Board

SUBJECT: Planning Board Recommendations for Amending the Methodology for Determining the Adequacy of Transportation Facilities

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ABSTRACT: In adopting the FY94 Annual Growth Policy, the Montgomery County Council directed the Planning Board to prepare recommendations for amending the methodology for determining what constitutes "adequate" when setting staging ceilings or requiring intersection improvements. The Planning Board's recommended amendments address the Council's specific interest in seeing that the methodology is more sensitive to non-auto modes of travel and the Council's concern that the current method of counting freeways gives too much weight to through traffic.

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PLANNING BOARD RECOMMENDATIONS FOR AMENDING THE FY94 ANNUAL GROWTH POLICY

Overview

This document contains two Planning staff papers -- as reviewed and adopted by the Planning Board -- on issues the County Council asked to be addressed in an Annual Growth Policy Amendment. These issues concern the methodology for determining the adequacy of transportation facilities. A third issue, establishment of a Clarksburg Policy Area, will be addressed pending resolution of the *Clarksburg Master Plan*.

Background

When the County Council adopted the *FY94 Annual Growth Policy*, it also approved changes to the process for review and approval of the AGP. The AGP process legislation adopted by County Council divided the AGP process into two tracks: one which sets limits on the amount of development which can be approved based on the availability of public facilities (the "ceiling element"), and another which investigates policy issues related to growth management in Montgomery County (the "policy element").

The "ceiling element" is to be adopted every year, while the "policy element" is to be prepared every two years, beginning next year.

For the "ceiling element," Planning staff released the *Staff Draft FY95 AGP* in November 1994. This document, which is similar in many ways to previous staff draft AGPs except that it does not address policy questions, must be reviewed and adopted by the Planning Board by May 1. Staff expects to bring it before the Planning Board in April once CIP decisions are generally finalized. Upon approval, the *Planning Board (Final) Draft FY95 AGP* will be sent to the County Executive for his review and transmission to County Council.

Although the first "policy element" will not be adopted until late in 1995, there were a number of issues that the County Council wanted to resolve in 1994. These include changing the methodology for determining the adequacy of transportation facilities and the establishment of a Clarksburg Policy Area. The Council directed that these issues be addressed in an AGP amendment, which is the focus of this document.

The Planning Board will make recommendations concerning the establishment of a Clarksburg Policy Area once the County Council's review of the Clarksburg Master Plan is complete. The papers making up this report concern the methodology for determining the adequacy of transportation facilities.

Adequacy of Transportation Facilities

In June 1992, the County Council asked the Planning Board to review the methodology for determining the adequacy of transportation facilities, "including studying how or whether the level of service (LOS) on freeways should be included in the calculation of staging ceilings, options for allowing LOS categories to be more sensitive to non-automobile modes of travel, and a review of the critical lane volume standards for Local Area Transportation Review."

Planning Department staff prepared an exhaustive analysis of the many options for measuring levels of transportation service and determining what levels should be considered "adequate" in the staff draft FY94 AGP released in November 1992. These were reviewed by citizens at a public forum, the Planning Board in worksession, and the County Executive prior to County Council AGP worksessions in the spring of 1993. For each issue, the Planning Board made preliminary recommendations and suggested that the Planning staff develop a set of staging ceilings for each of these recommended methodologies as part of the FY95 AGP work program. More specifically, the Planning Board's recommendations were:

- For Policy Area Transportation Review (PATR), keep the current six-group system for the FY94 AGP. For FY95, develop an alternative set of staging ceilings based on a total transportation level of service;
- Also for PATR in FY94, continue to measure roadway level of service using an Average Congestion Index that counts freeways. For FY95, develop an alternative set of staging ceilings using an Average Congestion Index that treats freeways differently;
- For Local Area Transportation Review (LATR), retain the CLV (critical lane volume) method as the primary measure of intersection level of service. The Board also recommended a single standard of 1,800 CLV for intersections within Metro station policy areas for FY94 implementation, which was subsequently adopted by the County Council;
- Also for LATR, investigate for FY95 implementation ways to adjust standards for intersection level of service to reflect policy area levels of transit service and use. Also, investigate how to modify trip vehicle rates or CLV on a case-by-case basis when developers provide enhanced transit access and pedestrian conditions on or off site.

The County Council concurred with these recommendations, and prior to the breakup of the AGP process into two tracks, the FY95 Staff Draft AGP was to include alternative staging ceilings reflecting the proposed changes in the methodology. It was also to include additional study of the selected methodologies for final consideration. To conform to the new AGP schedule, these policy issues are being addressed in an AGP amendment.

This document contains the Board's recommendations for resolution of the transportation adequacy methodology issues. The Board notes that these recommendations respond to the specific work program defined by the County

Council (in italics above) which followed a review of the many options available. The Policy Area Transportation Review recommendations were also the subject of a Planning Board worksession last September and have been reviewed and approved by the Transportation Modeling Technical Advisory Committee. The Local Area Transportation Review (LATR) recommendations were developed in coordination with a LATR Guidelines Working Group composed of County Council and Executive staff, traffic engineers from the private sector, and citizens.

These recommendations are being transmitted to the County Executive for a 45-day review period, after which they will be considered by the County Council. In addition, the Planning Board expects to transmit the *Final Draft FY95 AGP* (staging ceilings) by May 1 so that both elements will be on the same "track" for County Council public hearings in June and action by July 15 (the deadline for the ceiling element).

OUTLINE OF RECOMMENDATIONS

I. Policy Area Transportation Review (PATR)

A. Methodology for Counting Freeways

1. *Recommendation 1:* Test staging ceilings for their effect on freeways countywide, rather than their effect on the segments of the freeway network within that policy area.
2. *Recommendation 2:* Set a countywide freeways standard of "D/E" which is 90 percent of capacity (approximately what the current process permits).
3. *Recommendation 3:* Structure the test so that freeway congestion stays as close to the standard as possible, and that the freeway standard will not be exceeded unless it is balanced by available capacity on local roads.

B. Making Policy Area Transportation Review More Sensitive to Transit

1. *Recommendation 1:* Replace the current six-group system with a Total Transportation Level of Service (TTLOS) which reflects the level of service on all modes of transportation (auto, transit, bicycle, walking, etc.)
2. *Recommendation 2:* Measure non-auto level of service using an index called Regional Transit Accessibility, which measures how easily a policy area's residents and workers can use modes other than the auto to get to their destinations.
3. *Recommendation 3:* Structure TTLOS to measure usage as well as availability of transit and other non-auto modes. Incorporate into the equation the current policy of permitting greater levels of auto congestion in areas where transit availability and use is greater.
4. *Recommendation 4:* Set a TTLOS standard of "C-" to minimize changes to the staging ceilings due solely to a change in methodology while maintaining the adequacy of the roadway network.

(continued)

OUTLINE OF RECOMMENDATIONS (*continued*)

II. Local Area Transportation Review (LATR)

A. *Vary Congestion by Policy Area's Transit Availability*

Recommendation: Permit additional intersection congestion where increased transit alternatives are available while reducing permitted intersection congestion in areas with minimal transit service.

B. *Establish Adequacy for Pedestrian Transportation*

Recommendation: Require a "safe and convenient pedestrian path" between new development and certain activities within 1/4 mile, when construction of off-site sidewalks by a developer is feasible.

C. *Permit Developers to Mitigate Some Trips by Providing Non-Auto Transportation Enhancements*

Recommendation: Add construction of sidewalks and bus shelters -- in a limited fashion -- to the measures a developer may take to mitigate trips for LATR.

D. *Reflect Mode Usage in Vehicle Trip Generation Rates*

1. *Recommendation 1:* Revise LATR to better reflect the fact that development accessible to Metro stations generates a smaller percentage of vehicle trips than does similar development at other sites.
2. *Recommendation 2:* Apply discounts to trip generation rates for multi-family housing within 1/2 mile of Metro and large retail sites within 1/4 mile of Metro.
3. *Recommendation 3:* Discount by 5 percent trips generated by development in neighborhoods designated "Transit and Pedestrian Oriented."

POLICY AREA TRANSPORTATION REVIEW

POLICY AREA TRANSPORTATION REVIEW ISSUES

Introduction

Last year, the Montgomery County Council directed the Planning Board to review alternatives to the current method for measuring the adequacy of transportation facilities in the Annual Growth Policy. Of the many alternatives discussed, the Council selected two related to Policy Area Transportation Review (staging ceilings) for further study. These were described as how and whether to include freeways in Policy Area Transportation Review (PATR), and how to make PATR more sensitive to the availability of transit and other non-auto modes of travel.

This document discusses the Planning Department's analysis and the Planning Board's recommendations on these two issues in two parts. The first part includes a summary of the Board's recommendations, followed by a general review of both issues and the approaches used by staff in developing alternatives. This section also includes staging ceiling tables which compare the current draft FY95 staging ceilings to the staging ceilings which would result from the implementation of the Board's recommendations.

The second half of this paper discusses the two issues in more detail. Alternatives not recommended by the Board are explained and evaluated. End notes present the mathematical foundations of each alternative. Estimates of the staging ceilings that would result from implementing other combinations of alternatives are included in the second section.

PART I: SUMMARY OF RECOMMENDATIONS AND ANALYSIS

Summary of Recommendations

The Planning Board is recommending AGP changes related to both of the Policy Area Transportation Review (PATR) issues that the Council identified for further study. These changes affect the way staging ceilings are calculated and would result in revised staging ceilings for some policy areas.

The Planning Board recommends modifying the method for considering freeways in the calculation of staging ceilings so that the methodology better reflects the different character of freeway and local road traffic. Under the current system, congestion on freeway segments adjacent to a given policy area is averaged (weighted by volume) with congestion on local roads in that policy area to determine the appropriate staging ceiling. This system has been criticized as giving freeway conditions too much significance in the calculation of staging ceilings.

The new system proposed by the Board would establish a countywide standard for freeway level of service, rather than counting them as part of the adjacent policy area. In essence, the entire freeway system would be treated a separate policy area. The Planning Board is recommending that the countywide standard for freeway level of service be set at "D/E."

The Planning Board also believes that it is desirable to make the PATR process more sensitive to non-automobile modes of transportation. Under the current system, each policy area is assigned to one of six groups that define level of transit service. The higher the level of transit service, the more roadway congestion is permitted. This system has been criticized because it takes a significant increase in transit for a policy area to change from one group to another. No additional staging ceiling capacity is created as a result of a transit improvement unless the group classification changes.

The new system proposed by the Board incorporates the levels of service on non-automobile modes explicitly into a total transportation level of service standard. Each policy area would have the same level of service standard that would have to be achieved through a combination of roadway and transit facilities. The principle of better transit service balancing more roadway congestion would still apply. This system would provide closer links between the provision of transit service, congestion standards, and the resulting staging ceilings. Staff recommends that the total transportation (roadway and transit) level of service standard for each policy area be set at "C-."

The staging ceilings that would result from these two changes to PATR are shown in Table 1. Countywide, the recommended approach would add 19,000 jobs and 24,260 housing units to the FY95 Draft Net Staging Ceilings. Of these, approximately 3,200 jobs and 4,600 housing units would be applied toward deficits in moratorium areas. The rest, approximately 15,800 jobs and 19,600 housing units, would be added to the net remaining capacity in policy areas that are positive. This is equivalent to approximately 18 months of job growth and 36 months of housing growth, using our intermediate forecasts.

If the recommendations are adopted, the policy areas that would emerge from housing subdivision moratorium are Cloverly and North Potomac. Cloverly's net remaining capacity would be 291 units; North Potomac's would be 80 units. Other policy areas that would see housing increases are Bethesda-Chevy Chase, Bethesda CBD, and Silver Spring CBD -- where the bulk of the housing to be constructed is multi-family -- and Germantown West, R & D Village, and Olney. The policy areas that would emerge from jobs moratorium are Cloverly (to a net remaining capacity of 315 jobs) and Montgomery Village/Airpark (to a net remaining capacity of 979 jobs). Other policy areas that would see jobs increases are Germantown West, R & D Village, and Olney.

The ceilings that would result from only one or the other of these two changes are shown in tables 3 and 4 in Part II of this paper.

**Draft FY 95 Net Ceilings Under Current Policy
Compared to
Expected Ceilings Under the Two Recommended Policy Changes**

TABLE 1

HOUSING

January 1, 1993 Base	Current Policies			Recommended Policies	
	Pipeline 9/30/93	FY 95 Draft Net Housing Ceiling	FY 95 Remaining Capacity	Additional Ceiling	New Remaining Capacity
Policy Areas	A	B	C=B-A	D	E=C+D
Aspen Hill	2,439	(2,709)	(5,148)	0	(5,148)
Bethesda CBD	223	2,323	2,100	1,300	3,400
Bethesda/Chevy Chase	855	1,665	810	6,000	6,810
Cloverly	423	(1,286)	(1,709)	2,000	291
Damascus	343	(625)	(968)	0	(968)
Derwood/Shady Grove	95	1,474	1,379	0	1,379
Fairland/White Oak	1,290	(1,171)	(2,461)	0	(2,461)
Gaithersburg City	1,865	3,409	1,544	0	1,544
Germantown East	3,961	4,755	794	0	794
Germantown West	3,055	3,700	645	4,500	5,145
Germantown Town Center	138	1,902	1,764	0	1,764
Grosvenor	0	1,400	1,400	0	1,400
Kensington/Wheaton	616	7,449	6,833	0	6,833
Montgomery Village/Airpark	1,697	1,723	26	0	26
North Bethesda	358	2,109	1,751	0	1,751
North Potomac	1,327	(1,593)	(2,920)	3,000	80
Olney	1,892	2,412	520	500	1,020
Potomac	1,402	2,873	1,471	0	1,471
R & D Village	1,765	2,571	806	3,500	4,306
Rockville City	1,249	1,352	103	0	103
Silver Spring CBD	1,987	2,665	678	3,460	4,138
Silver Spring/Takoma Park	273	2,529	2,256	0	2,256
Twinbrook	0	300	300	0	300
Wheaton CBD	15	1,624	1,609	0	1,609
White Flint	751	1,700	949	0	949
Totals	28,019	49,935	27,738	24,260	47,369

EMPLOYMENT

January 1, 1993 Base	Current Policies			Recommended Policies	
	Pipeline 9/30/93	FY 95 Draft Net Jobs Ceiling	FY 95 Remaining Capacity	Additional Ceiling	New Remaining Capacity
Policy Areas	A	B	C=B-A	D	E=C+D
Aspen Hill	14	348	334	0	334
Bethesda CBD	1,679	6,984	5,305	0	5,305
Bethesda/Chevy Chase	2,638	5,847	3,209	0	3,209
Cloverly	30	(155)	(185)	500	315
Damascus	213	298	85	0	85
Derwood/Shady Grove	2,569	2,892	323	0	323
Fairland/White Oak	6,484	(1,547)	(8,031)	0	(8,031)
Gaithersburg City	18,358	18,412	54	0	54
Germantown East	15,004	15,380	376	0	376
Germantown West	9,353	10,663	1,310	7,500	8,810
Germantown Town Center	2,697	7,104	4,407	0	4,407
Grosvenor	0	0	0	0	0
Kensington/Wheaton	249	14,212	13,963	0	13,963
Montgomery Village/Airpark	5,734	2,713	(3,021)	4,000	979
North Bethesda	6,184	6,684	500	0	500
North Potomac	223	364	141	0	141
Olney	882	1,549	667	1,000	1,667
Potomac	113	2,273	2,160	0	2,160
R & D Village	6,123	9,516	3,393	6,000	9,393
Rockville City	21,515	9,641	(11,874)	0	(11,874)
Silver Spring CBD	8,914	9,477	563	0	563
Silver Spring/Takoma Park	887	1,524	637	0	637
Twinbrook	0	971	971	0	971
Wheaton CBD	115	3,778	3,663	0	3,663
White Flint	1,174	4,239	3,065	0	3,065
Totals	111,152	134,869	45,126	19,000	60,920

Background and Approach

Montgomery County uses Policy Area Transportation Review (staging ceilings) to determine the amount of new development that can be supported by additions to the County's transportation network. How this determination is made has been the focus of much discussion and study as long as there has been an Annual Growth Policy.

The FY94 Final Draft Annual Growth Policy contained a thorough review of alternative methodologies for evaluating the adequacy of transportation facilities. For the FY95 AGP, the Planning Board was asked by the County Council to make recommendations concerning PATR. Specifically:

- "how or whether the level of service on freeways should be included in the calculation of staging ceilings; and
- "the desirability of changing the level of service standard for Policy Area Transportation Review to be more sensitive to ride-sharing, transit, and non-motorized transportation alternatives to the automobile."

When changing methodology for Policy Area Transportation Review, three issues need to be addressed:

- 1) how to measure level of service (LOS),
- 2) what standard should be considered acceptable, and
- 3) the resulting transportation staging ceilings.

Selection of the most appropriate measurement system is largely a technical issue, but selection of a standard is a policy question that depends upon how much congestion or staging ceiling is considered acceptable. These recommendations concerning standards and ceilings reflect a desire to avoid radical changes in acceptable congestion levels and to avoid placing additional policy areas in moratorium.

Freeway Measurement System

Currently, congestion on freeway segments is assigned to the policy area surrounding or adjacent to the freeway segment. Congestion on the East Spur of I-270, for example, is assigned to North Bethesda.

Policy areas associated with congested freeway segments are in a difficult position with regard to staging ceiling. Since freeways carry more vehicles than local roads, a policy area with congested freeways will need major improvements to other transportation facilities to see anything more than modest increases in staging ceiling. Conversely, a policy area with congested local roads could receive a substantial staging ceiling increase from improvements to its segment of a freeway. In both cases the argument is made that freeway conditions play too big a part in evaluating staging ceilings because of "through trips" -- much

of the traffic on any given segment of a freeway neither begins nor ends in the associated policy area. So while the level of service on a freeway segment is a major factor in evaluating a policy area's staging ceiling, changes in a policy area's staging ceiling can have a relatively small impact on that segment's level of service.

One suggested remedy has been to simply eliminate freeways from Policy Area Transportation Review. The "no freeways" option is not supported by the Planning Board. To do so would suggest that freeway congestion is not an important issue to Montgomery County residents or that land use decisions in Montgomery County have no effect on freeway congestion. Neither of these is true.

Instead, the Board proposes that the freeway test be modified to better reflect that freeway traffic and local road traffic relate differently to a policy area's staging ceiling. Staff believes an improved freeways methodology would look at the relationship of staging ceilings to the countywide freeway network, rather than a discrete freeway segment. Local roads would still be considered on a policy area basis. This countywide freeway methodology would increase the relative importance of local road congestion in the setting of staging ceilings. At the same time, it would assure that overall roadway congestion remains acceptable.

If freeways are measured on a countywide basis, how much congestion is acceptable?

One option is to have fixed standards for both freeways (on a countywide basis) and local roads (on a policy area basis). The problem with this approach is that if freeway congestion goes above the standard, the entire County would be placed in subdivision moratorium. The risk of a countywide moratorium is unacceptable, and the Planning Board cannot recommend using a fixed countywide freeway standard.

The option recommended by the Board is similar, but more flexible. It permits congestion on the countywide freeway system to be balanced, in part, by available capacity on local roads. This is similar to what is done now, except that currently a policy area's local road traffic balances only the freeway segment in or along side that policy area.

Under the proposed system, alternative staging ceilings would be evaluated until a set is found which minimizes the difference between projected levels of traffic congestion and the congestion standard for local roads in every policy area individually as well as for the freeways countywide. To the extent that estimated congestion deviates from the standard on freeways or on local roads in one of the policy areas, then it must be offset in other areas.

In policy areas with freeways, the freeways have been the main constraint on staging ceiling because the freeways have been more congested than the local roads. The effect of implementing the countywide freeways methodology will be an increase in staging ceiling in

policy areas where the disparity between freeway and local road congestion is greatest.

Making PATR More Sensitive to Alternative Modes of Transportation

The availability of alternative modes of transportation (transit, ridesharing, cycling, etc.) is a major factor in setting a policy area's staging ceilings. The current method requires policymakers to assess numerous factors -- including transit frequency and coverage, miles of sidewalks and bikeways, park-and-ride lots, and so forth.

Policy areas are assigned to one of six transit level of service groups. Group VI areas have the highest availability of transit; Group I (rural) areas the lowest. A roadway congestion standard is then assigned to a policy area based upon its transit LOS Group. The higher the level of transit availability, the more roadway congestion is allowed. For example, Group IV areas are permitted roadway congestion at Level of Service "D" while in Group III areas, roadway congestion should not be worse than LOS "C/D." In order for a policy area to move to a higher transit LOS group, major improvements to transit availability are required.

In recent years there have been frequent suggestions that since the six-group system does little to encourage modest improvements in transit availability, the AGP is working against the County's goal of decreasing the share of single-occupant vehicles during the rush hours. Alternatives to the six-group system have been proposed, but none have been adopted. In particular, a nine-group system was considered but rejected because the increase in sensitivity was not considered to be enough to warrant the increase in complexity. In addition, the current system only indirectly accounts for mode usage in setting standards.

In the FY94 AGP, Planning Department staff explored the concept of a Total Transportation Level of Service. Instead of a group system, the transit level of service for each policy area would be calculated at the same ^{way} that the roadway level of service is calculated. The transit level of service number would include all kinds of non-auto transportation.

These two LOS numbers would be combined in a way that accounts for how many people use the roadways versus how many people use transit. The resulting number would then be a measure of the level of service experienced by users of all kinds of transportation in a policy area.

The total transportation level of service (TTLOS) concept received positive comment during consideration of the FY94 AGP. Planning staff has further refined the concept and the Planning Board is now recommending its adoption.

The key to calculating the transit (that is, non-auto) portion of TTLOS is deciding how to measure it. After reviewing many possibilities, the Planning Board recommends a system which calculates how easy

it is to reach potential destinations as the best measure of service. Planning staff terms this quality "regional transit accessibility." The Board believes this is a realistic measure because it mirrors the questions people ask themselves before deciding whether or not to use non-auto modes of transportation:

- "Can I get to my destination using a mode other than a car?"
and
- "How fast is that trip going to be?"

The answers to these two questions can be converted to a number between 0 and 1 which expresses the level of service experienced by users of non-auto modes of travel (Transit LOS). Roadway LOS is also a number between 0 and 1, so the two numbers can be combined easily.

To combine them, Transit LOS is multiplied by the percentage of people who actually experience Transit LOS (users of non-auto modes of travel). Auto LOS is multiplied by the percentage of people who experience Auto LOS (commuters by car). The two numbers are added together for the Total Transportation Level of Service number.

Because it is weighted by actual use, TTLOS accounts for both how much transit is improved as well as how many new transit users are attracted by a transit improvement. Similarly, a roadway improvement is evaluated both by how much it improves roadway conditions as well as how many auto users experience that improvement.

Recommended Level of Service Standards

Changing the method for testing the adequacy of transportation facilities will result in revised policy area staging ceilings. Exactly how staging ceilings will change depends on the LOS standard chosen.

The philosophy used to develop the recommended LOS standards was twofold:

- maintain adequate levels of service on the County's transportation network and
- minimize the overall impact of the new methodologies on staging ceilings countywide and, in particular, minimize the number of policy areas where staging ceilings are reduced.

Naturally, maintaining appropriate standards for levels of transportation service is the overriding priority. The reasoning for minimizing the overall impact is that confidence in the effectiveness of the AGP could be undermined if significant changes in staging ceiling result from a change in methodology.

The Planning Board's recommendation for a countywide standard for freeway level of service is "D/E," which is approximately 90 percent of capacity. This level of service has stable flow and average travel speeds which are about 40 miles per hour. On average, this is the LOS on freeways countywide under the current AGP test. For the Total Transportation Level of Service, Planning staff's recommended level of service standard is "C-." This grade is between the auto level of service currently permitted in the Group II and Group III areas.

In both cases, if a tougher standard were selected, additional policy areas would go into subdivision moratorium and others would move deeper. If the standard were less stringent than recommended, significant amounts of additional development could be approved.

Resulting Staging Ceilings

With both recommended policy changes, staging ceiling increases predominately occur in two types of policy areas.

First, the staging ceilings in Group II policy areas increase, partially because local roads in some of these areas are less congested than the freeways. Implementing a countywide freeways test gives local roads greater weight, resulting in higher staging ceilings in these areas. Increases in Group II staging ceilings can also be attributed to the fact that the TTLOS standard of C- permits somewhat more traffic than the current auto LOS standard of C for Group II areas. However, it is important to note that these increases were limited since development in the Group II areas affects congestion in other policy areas.

Second, in policy areas inside the Beltway, housing staging ceilings increase to the estimated zoned holding capacity. These housing increases can be accommodated on local roads under the new standard and have minimal impact on peak direction freeway traffic.

Part II of this document goes into greater detail about the staging ceilings that result from implementing some or all of the Board's recommended policy changes. Table 3 shows the staging ceilings that would result if the countywide freeways test were implemented, but not TTLOS. Conversely, table 4 shows the staging ceilings that would result if TTLOS were implemented but not the countywide freeways test.

Also in Part II is the justification for the recommendation of LOS "D/E" as the level of service standard for freeways and LOS "C-" as the standard for total transportation level of service.

**PART II: DETAILED DISCUSSION OF VARIOUS ALTERNATIVES FOR ADDRESSING
THE FREEWAYS ISSUE AND MAKING POLICY AREA TRANSPORTATION REVIEW
MORE SENSITIVE TO TRANSIT**

THE "FREEWAYS ISSUE"

During the adoption of the FY94 Annual Growth Policy, the County Council instructed the Planning Board to investigate how or whether the level of service on freeways should be included in the calculation of staging ceilings for Policy Area Transportation Review (PATR). This discussion of the "freeways issue" is a follow-up to the analysis in the Final Draft FY94 Annual Growth Policy (December 1992) and the Planning Board's May 1993 AGP worksession.

Freeways are defined as roadways with limited access and no at-grade intersections. In Montgomery County, the freeways presently include I-495, I-270, I-370, and the Clara Barton and Cabin John Parkways. Considered "local roads" in the AGP are those classified as major highways, arterials, and selected business, industrial, and primary residential roads identified in the Master Plan of Highways. Trips on "local roads" are often generated in the policy area containing the road. Generally, staging ceiling increases are only associated with capacity increases on freeways, major highways and arterials.

There is ample justification for treating "freeways" and "local roads" differently. One reason is the nature of the two classes of roads: even at the same volume-to-capacity ratio, different amounts of delay are experienced by travelers. Therefore different volume-to-capacity ratios for local roads and freeways may be equally adequate. A second reason concerns through trips vs. locally-generated traffic. Freeways contain a higher proportion of through trips than do local roads. Hence it is often inappropriate to attribute freeway traffic to a single policy area.

In the FY94 AGP, four options for considering freeways were discussed:

- Areawide Average Congestion Index that Includes Freeways (current system);
- Areawide Average Congestion Index that Counts Local Roads but Excludes Freeways;
- Volume-Based Average User Level of Service; and
- Delay-Based Average User Level of Service.

The Planning Board recommended -- and County Council concurred -- staying with the Areawide Average Congestion Index rather than switching to a User Level of Service. The County Council asked for further evaluation of the freeways issue, in particular an analysis of staging

ceiling implications. For this evaluation, four new options using the Areawide Average Congestion Index were investigated.

Four Options Investigated:

- Option 1: Consider Local Roads with Policy Area Standard and Don't Consider Freeways;
- Option 2: Consider Local Roads with Policy Area Standard and Consider Freeways with Countywide Standard;
- Option 3: Consider Two Separate Policy Area Standards for Freeways and Local Roads, and Pass Both; and
- Option 4: Consider Two Separate Policy Area Standards for Freeways and Local Roads, and Pass Average of Two.

In brief, option #1 is the same as the current method except that freeways are not counted in the Average Congestion Index. Without changing Group standards, this option results in large amounts of additional staging ceiling and congestion. It also prevents review of congestion conditions on the County's freeways.

Option #2 would continue to include freeways in the Areawide Average Congestion Index, but would count them in a different way. While local roads would be subject to the policy area's level of service standard, freeways would be subject to a countywide LOS standard. This is in contrast to the current method, which requires counting both the local roads and freeway segments in/beside a policy area in the Areawide Average Congestion Index. This option was tested by setting a countywide freeway standard of LOS "D/E," which is approximately 90 percent of capacity.

Option #3 considers separate policy area standards for freeways and local roads. This option requires freeways to "pass" a freeway standard and requires local roads to pass a different local road standard. This option allows higher volume-to-capacity ratios on freeways than local roads. Freeways continue to be associated with adjacent policy areas.

In option #4 -- "Consider Two Separate Policy Area Standards for Freeways and Local Roads and Pass Average of Two" -- there are different standards on freeways and local roads, but an average policy area "Composite Congestion-to-Standard Ratio" is computed. Again, freeways are associated with adjacent policy areas.

All four options are discussed in order on the following pages. Numbers in superscript refer to end notes which discuss the equations used to evaluate the various options.

Review of Options

Option #1 Consider Local Roads with Policy Area Standard and Don't Consider Freeways

Prior to developing alternative "freeway" scenarios, the Planning Department performed preliminary analysis of the effects on transportation staging ceilings of not counting freeways in the Areawide Average Congestion Index. The current method of setting auto level of service standards -- by policy area group -- was maintained. The preliminary analysis identified the land use that would meet the current level of service standard counting only local roads.¹

The results demonstrate that the current standards are appropriate only if freeways are counted. This is expected since the current standards were set with the assumption that both the freeways and local roads would be counted. Since freeways typically have greater volume-to-capacity ratios than local roads, the freeway-and-local-roads standard permits more congestion than a local-roads-only standard. Significantly higher staging ceilings result when the freeways-and-local roads standard is used to test local roads only.

If only local roads are to be considered for Policy Area Transportation Review, a new set of LOS standards -- appropriate for local roads -- would have to be developed. Staging ceilings using the new standards could then be established.

A key reason for not proceeding with this option is that excluding freeways from the area-wide LOS will eliminate a major motivation to improve these roads (essentially the interstates) since improvements would no longer result in significant increases to staging ceilings. Minor staging ceiling increases would result only if the freeway improvement removes some congestion from local roads. Currently, the significant expense of major freeway improvements is partially compensated by the additional staging ceiling that results.

At the direction of the Planning Board during the September 13, 1993 AGP worksession, Planning Department staff has not pursued this option further. Instead, the concept of differential standards for freeways and local roads was considered to have more merit for additional study (options 2, 3, and 4).

Option #2 Consider Local Roads with Policy Area Standards and Consider Freeways with Countywide Standard

The Board recommends this option as the best approach for dealing with freeways in the Annual Growth Policy. This option is an alternative to eliminating freeways from the LOS measurement entirely. Here, each policy area would have a auto level of service standard based on transit LOS (as it is now). This auto LOS standard would be for

local roads only, however. The auto LOS standard on *freeways* would be the same countywide and be independent of policy area transit LOS.

To evaluate staging ceilings, congestion is considered on local roads in 18 policy areas (Metro station and town center policy areas are grouped with the surrounding area for congestion tests) and on freeways countywide.

Under the proposed system, new staging ceilings would be tried until a set is found which minimizes the difference between congestion and the standard for local roads in every policy area individually as well as for the freeways countywide². To the extent that either freeway or local road congestion deviates from its standard, that deviation has to be offset in other areas.

If freeway congestion becomes worse than the countywide standard, would the entire county necessarily be placed in subdivision moratorium? This is an important question since the state largely controls the financing for freeway improvements. The answer is "no" for two reasons. First, the methodology for setting staging ceilings would allow less congestion on some facilities (generally local roads) to offset additional congestion on others (generally freeways). Second, the County can periodically reallocate net remaining capacity among policy areas and between jobs and housing (while respecting zoning constraints) which would result in more optimal road utilization. Presently, staging ceilings are only modified in conjunction with a change in transit LOS group or when a new roadway is programmed for construction.

This approach would continue to constrain development because of freeway congestion where appropriate. Freeway congestion would remain the limiting factor in many policy areas.

In evaluating this approach, a level of service standard for freeways is needed. Ideally, standards of transportation performance are those that are the most economically efficient overall. Efficiency minimizes the cost of infrastructure as well as the cost to travelers in terms of recurring delay. Both under-utilized infrastructure and excessive delay resulting from overused facilities are inefficient. Standards may also reflect the economic benefits (e.g. higher real estate values, more commerce) resulting from increased regional accessibility. Standards which maintain certainty in the regulatory process, and do not result in drastic changes from the current ceilings, are desirable as well.

A peak hour level of service standard of "D/E" meets the above requirements for a freeway standard in Montgomery County. This LOS, about 90 percent of capacity, still has stable flow and average travel speeds which are about 40 miles per hour. Clearly there will be some links which are below and others which are above this level. On average, with the 1998 network and the adopted gross staging ceilings (the standard AGP test), this is the LOS on freeways countywide.

A peak hour level of service "D/E" also would not result in drastic changes from the current ceilings. A more stringent standard would result in much of the County entering subdivision moratorium. A less stringent standard would increase staging ceilings (and freeway congestion) significantly. Either change would undermine confidence in the AGP process.

This option was tested twice. The first test used the current Six-Group standard as the level of service standard for local roads. In the second test, the level of service standard is determined by the total transportation LOS discussed in the next section (the other change in the PATR process the Council asked staff to study). The results of the first test are shown in Table 3 (page 26). The second test generated the recommended ceilings shown in Table 1 at the beginning of this paper.

The Board recommends this option because it accounts for the fact that freeways relate to land use differently than do local roads. It permits the use of freeway standards appropriate for freeways and local road standards appropriate for local roads, rather than one standard for both. Freeways are not segmented and assigned to policy areas; rather, the relationship of policy area land uses to the countywide freeway network is measured. This system also accounts for the high proportion of through trips on freeways.

This alternative is less complex than options #3 and #4 below, and unlike option #1, it continues to consider freeways.

**Option #3 Consider Two Separate Policy Area Standards for
Freeways and Local Roads, and Pass Both**

Option #3 involves setting separate standards for freeways and local roads in each policy area. Currently each policy area has one standard based on its level of service group. With this alternative, each policy area would have two standards - one for local roads and one for freeways. A policy area would have to meet both standards to stay out of moratorium.

While our current system evaluates the combination of freeways and local roads, this option, like option #2 above, tests both separately.³ The key difference between options #2 and #3 is geographic. In option #3, freeway LOS is evaluated on a policy-area-by-policy-area basis, while option #2 considers freeways countywide.

A disadvantage of option #3 is that policy areas will be more dependent, not less, on freeway improvements for increases in staging ceiling. For example, it will be particularly difficult to add staging ceiling to policy areas adjacent to freeways that are unlikely to be widened -- such as sections of the Beltway -- because the high volume and level of congestion on the freeway outweigh any local road improvement.

Below are three cases that demonstrate the possible results from this kind of dual standard. In this example, a Group II area has a 0.88 freeway standard and a 0.55 local road standard. In the first case, an area fails because freeway congestion (0.90) is too high. In the second case, the area fails the test because congestion on local roads (0.66) is too high. In the third, the area passes.

Case	AVERAGE CONGESTION INDEX			Result
	Freeway	Local	Overall	
(1)	0.90	0.40	0.65	- FAIL
(2)	0.66	0.66	0.66	- FAIL
(3)	0.87	0.54	0.76	- PASS
STANDARD	0.88	0.55		

Even though case (1) has less overall congestion than case (3), case (1) fails while case (3) passes. The same is true of case (2) versus case (3). The ability of the system to produce illogical answers works against this as an option.

After careful consideration, the Planning Board recommends against this approach because it adds complexity to the AGP while not necessarily producing consistent results. In addition, it still associates specific freeway sections with adjacent policy areas.

Option #4 Consider Two Separate Policy Area Standards for Freeways and Local Roads, and Pass Average of Two

A variation on option #3 would retain different standards for freeways and local roads, but rather than having to pass both, a policy area would only need to pass the average of the two standards.

Measurement of congestion is structured as a ratio. When traffic congestion is equal to the standard, the resulting number is 1. If traffic is less congested than the standard, the resulting number is less than one, and staging ceilings may be increased. If the traffic is more congested than the standard, the resulting number is greater than 1, and staging ceilings must be decreased. This ratio is the "congestion-to-standard ratio."

This option looks at the average of the congestion-to-standard ratio for a policy area's freeways and the congestion-to-standard ratio for a policy area's local roads. This average ratio is referred to as the Composite Congestion-to-Standard Ratio (CCSR).⁴

For example, suppose a Group II area has a local road standard of 0.55 and a freeway standard of 0.66. Suppose the Average Congestion

Index on freeways was 0.70, while on local roads the ACI was 0.50. Finally, suppose half the vehicle-miles travelled (VMT) were on freeways and half on local roads. The resulting equation would be:

$$\text{CCSR} = \frac{0.70 * 50\%}{0.66} + \frac{0.50 * 50\%}{0.55} = 0.97 \text{ PASS, ACI} = 0.60$$

In the example, the freeways were above standard and local roads were below, but a passing score was obtained on the CCSR because the average of the two ratios was below 1.

Option #4 has more flexibility than option #3 because it permits congestion on a freeway segment to be offset by underutilized capacity on local roads. However, because it associates freeway segments with adjacent policy areas, it does not address through trips.

This approach is also not recommended because it is more complicated than option #2, without any additional benefits.

TOTAL TRANSPORTATION LEVEL OF SERVICE

During the adoption of the FY94 Annual Growth Policy, the County Council instructed the Planning Department to investigate methods for making Policy Area Transportation Review more sensitive to changes in transit level of service. In the current "Six-Group" system, the congestion standard of a policy area seldom changes -- even with significant changes in transit service or usage.

Twice previously, the Planning Board has considered and recommended against increasing the number of transit level of service groups, a recommendation which the County Council has accepted. The Planning Board now recommends that a direct trade-off between auto and transit LOS be used to determine a policy area's total transportation level of service (TTLOS). Improvements in either auto or transit level of service would result in proportionate increases in staging ceilings for housing units and/or jobs.

Several components are necessary to implement this system, and will be discussed in the following pages:

- Component #1* A Definition of Total Transportation Level of Service
- Component #2* A Countywide Standard for Acceptable Total Transportation Level of Service,
- Component #3* A Measure of Transit Level of Service; and,
- Component #4* A Measure of Auto Level of Service.

In order to balance transit and auto LOS, a single, total transportation LOS standard must be established and TTLOS must be measured for each policy area. The Planning Board recommends that transit and auto LOS be weighted by transit and auto mode shares respectively in calculating the average total transportation LOS for a policy area. Here, transit is defined to include bus, rail, walk, and bike; auto trips are defined to include all trips made by automobile, as either driver or passenger, and includes both SOV and HOV trips.

The selection of the standard depends on whether or not freeways are counted in policy area level of service. As noted previously, Planning staff recommends counting freeways using a countywide freeway standard. Assuming the countywide freeway standard approach is implemented, Planning staff recommends that the standard for total transportation LOS be set at "C-". If the current system for counting freeways is retained, staff recommends that the TTLOS standard be set at "C/D."

Staff reviewed several alternatives for measuring transit LOS, including frequency and accessibility. The Planning Board's recommendation is to measure transit LOS based on Regional Transit

Accessibility. Regional Transit Accessibility measures how easily users of transit can reach desired destinations. This measure is conceptually different than the volume-to-capacity ratio used for auto LOS, because the usefulness of the transit system is measured rather than congestion.

Policy Area Transportation Review currently uses the Average Congestion Index to measure auto level of service. The Average Congestion Index is defined as the volume-to-capacity ratio, weighted by vehicle miles of travel (VMT) on a scale ranging from A-F. During its AGP discussions in May 1993, the Planning Board agreed to continue use this measure, either with or without counting freeways in the computation.

**Component #1 A Definition of Total Transportation
 Level of Service**

There are three key features of Total Transportation Level of Service (TTLOS). First, it is fully sensitive to transit availability - most improvements to the non-auto transportation network will have a direct measurable effect on staging ceilings. Second, it takes into account usage of the various modes of transportation. Third, transit improvements can be used to directly balance increases in roadway congestion.

Underlying TTLOS is a simple equation which expresses these three characteristics mathematically. The following equation is recommended for calculating total transportation LOS in each policy area:

$$TTLOS = (\text{Auto LOS} \times \text{Auto MS}) + (\text{Transit LOS} \times \text{Transit MS})$$

where:	Auto LOS	= Automobile Level of Service
	Transit LOS	= Regional Transit Accessibility
	Auto MS	= Work trip mode shares by auto
	Transit MS	= 1 - Auto MS

Conditions on the automobile transportation network are represented on the left side of the plus sign, while conditions on the transit network are represented on the right side. Both conditions can vary as long as -- added together -- they do not exceed the level of service standard (TTLOS).

The above equation also shows that auto and transit LOS are combined using work-trip mode shares (MS) as a weighting factor. Here, "auto mode share" means all trips made in automobiles (including HOV and carpools), while "transit mode share" includes all other modes (Metro-bus, Metrorail, MARC, and walk/bike). Please see the endnotes for more discussion of mode shares⁵.

Component #2

***A Countywide Standard for Acceptable
Total Transportation Level of Service***

The use of a single total transportation level of service index requires establishing a passing grade. One consideration to keep in mind when selecting an average overall transportation standard is that it is different than having a single standard that each road segment in an area must meet. With an average standard, not all roadway links will meet the average. Some roadways will be better than average and some will be worse.

Therefore, the average standard must be set so that most links -- even some of those worse than the standard -- have acceptable congestion. A standard which is based on an average of all links (Policy Area Transportation Review) should therefore be set at a level which is less congested than that which is the minimum of what is acceptable on any given link or intersection (Local Area Transportation Review). This is the basis for our current system for setting staging ceilings.

Using the proposed countywide freeway approach, it is recommended that level of service "C-" be adopted as the overall standard for policy area transportation review. If the current system for counting freeways is retained, the "C-" TTLOS standard would result many policy areas seeing a reduction in their staging ceilings. Therefore, if the current freeway test is retained, staff would recommend using the less stringent TTLOS standard of "C/D" to balance the fact that the current freeway test permits less development than the recommended freeway test. These standards maintain adequate levels of service on the County's transportation network and minimize the overall impact of the new methodologies on staging ceilings countywide.

The "C-" grade is between the auto level of service currently permitted in the Group II and Group III areas. If an area has transit service better than "C-" it would be permitted to have auto service worse than "C-" and vice versa. The extent to which congestion would be permitted to get better or worse would be governed by the auto and transit mode shares, so long as an overall passing grade of TTLOS is maintained.

If a standard of "C" were selected for TTLOS, staging ceilings would be reduced significantly, resulting in additional and deeper subdivision moratoria. If a standard of "C/D" were selected for TTLOS, staging ceilings would be increased by a large amount and congestion on many more roads would be at levels now considered unacceptable.

Component #3

Transit Level of Service: Measure and Scale

In the current regulatory system, a policy area's transit LOS is expressed by assigning the policy area to one of six "groups". The assignment to a group is based on a bundle of quantified factors

measuring transit availability and use. Each group has associated with it a single acceptable automobile LOS. Because of the large range of transit service levels that define a group, it is very difficult to change groups. Thus, most additions to (or subtractions from) the transit system will not have any impact on the group designation or the recommended staging ceilings.

In order to provide a system which is sensitive to smaller changes in transit service than the current system, an understandable and quantifiable measure of transit LOS is desired. Transit LOS measures were discussed in part in the *FY94 Final Draft AGP* as part of the LATR issue. Some of the options discussed are listed below.

Options Considered for Measuring Transit Level of Service

<i>Measurement Type</i>	<i>Specific Measure</i>
<i>Opportunity</i>	<ul style="list-style-type: none">- Regional Transit Accessibility- % Jobs within 45 minutes- Average Transit Time/ Average Auto Time
<i>Frequency (peak)</i>	<ul style="list-style-type: none">- Transit Seat Miles per Hour per Street Mile- Transit Vehicle Miles per Hour per Street Mile
<i>Coverage</i>	<ul style="list-style-type: none">- % of Houses within 5 minutes of transit stop- % of Jobs within 5 minutes of transit stop- Auto Time from Home to Park-and-Ride Lot- % of Walk Trip on Sidewalks (Sidewalk Ratio)- Circuity of Walk Trip
<i>Volume/Capacity</i>	<ul style="list-style-type: none">- Passengers per Seat

In Planning staff's evaluation of the options, two in particular stood out -- Regional Transit Accessibility and Transit Frequency. These are discussed in more detail below. After considering the advantages and disadvantages of these options, the Planning Board recommends that Regional Transit Accessibility be adopted as the measure for transit level of service.

Regional Transit Accessibility

Regional Transit Accessibility measures how easy it is to reach destinations by transit. A policy area served by a network which connects the most houses to the most jobs in the least time by transit gets the highest accessibility index. Among the "opportunity" measures listed above, staff believes the Regional Transit Accessibility index is the most systematic, since it considers all jobs in the region. Accessibility is measured separately for each traffic zone. For

residences in a specific traffic zone, accessibility is calculated by multiplying the number of jobs in each of the other traffic zones by an "impedance" or "friction" factor, and then summing the total.

In measuring Regional Transit Accessibility, impedance is determined by the transit travel time between traffic zones. The impedance factor weighs close jobs more than far away jobs, and has been estimated from travel surveys. This factor is very stable over time, being statistically unchanged between 1968 and 1988. The mode-specific equations underlying this factor are presented in the TRAVEL/2 documentation (February 1993, draft), and are used in the model's trip distribution component.⁶ This measure is computed at the traffic zone level and averaged to obtain the policy area scores. The process is applied separately for a traffic zone's jobs and households.

Columns (A) and (B) of Table 2 show regional transit accessibility to Jobs and Households (resident work force) by policy area for the Adopted FY94 AGP staging ceilings and the anticipated four-year transportation network. Column (C), composite transit level of service, is computed as the weighted average of household (resident work force) and jobs accessibility (weighted by jobs and households respectively).

The Regional Transit Accessibility measure can be made consistent with the scale used for auto LOS. The auto LOS scale ranges from 0 to 1, with 0 being LOS "A" and 1 being midpoint LOS "E". Staff recommends that transit LOS "A" be defined as equivalent to that of the policy area with the best transit LOS (currently Silver Spring/Takoma Park). LOS "E" would be defined by the areas with the worst transit LOS (currently Clarksburg or Damascus). The LOS definitions would become an absolute scale, such that if transit accessibility improved in Silver Spring, then its LOS would be "A+", rather than the transit LOS in other areas being hurt by a new definition of LOS "A".

The following equation is used for transforming transit accessibility into a level of service scale:

$$\text{Transit LOS} = 1 - \frac{\text{Policy Area Composite Transit Accessibility}}{8,000}$$

As a computational example, consider Aspen Hill. The composite transit accessibility, column (C), for Aspen Hill is 4,998. The transit accessibility denominator is 8,000. Applying the equation above:

$$\text{Transit LOS} = 1 - \frac{4,998}{8,000} = 0.38 = \text{LOS "B"}$$

Factors Used in Calculating
Total Transportation Level of Service

TABLE 2

Including Transit Accessibility and Automobile Level of Service

POLICY AREA	Transit Accessibility					Automobile LOS		
	Jobs (A)	Housing (B)	Com- posite (C)	Index (D)	LOS (E)	Mode Share (F)	TTLOS Standard (G)	Current Standard (H)
Aspen Hill	5,220	4,263	4,998	0.38	B	0.89	0.63	0.66
Bethesda/Chevy Chase	10,979	5,766	7,283	0.10	A	0.77	0.75	0.88
Clarksburg	201	171	180	0.98	E	0.94	0.58	N/A
Cloverly	1,399	1,195	1,380	0.83	D	0.94	0.59	0.55
Damascus	323	363	342	0.96	E	0.93	0.57	0.55
Derwood/Shady Grove	4,716	2,227	2,810	0.65	C	0.83	0.59	0.66
Fairland/White Oak	3,915	3,308	3,608	0.55	C	0.86	0.61	0.66
Gaithersburg City	4,089	1,798	2,442	0.70	D	0.84	0.58	0.66
Germantown East	2,291	1,021	1,525	0.81	D	0.93	0.58	0.55
Germantown West	2,035	978	1,489	0.82	D	0.88	0.57	0.55
Kensington/Wheaton	8,495	5,827	7,356	0.09	A	0.83	0.71	0.77
Montgomery Village/Airpark	2,577	1,092	1,964	0.76	D	0.86	0.57	0.55
North Bethesda	10,593	3,880	5,553	0.31	B	0.76	0.69	0.77
North Potomac	1,573	783	1,500	0.81	D	0.93	0.58	0.55
Olney	2,316	2,128	2,251	0.72	D	0.94	0.59	0.55
Potomac	2,591	1,549	2,181	0.73	D	0.92	0.59	0.55
R & D Village	4,874	1,783	2,437	0.70	D	0.85	0.58	0.55
Rockville City	8,098	3,395	4,591	0.43	B	0.86	0.63	0.66
Silver Spring/Takoma Park	9,162	7,325	8,058	0.00	A	0.63	0.95	0.88

NOTES:

1. *BETHESDA/CHEVY CHASE includes BETHESDA CBD.*
2. *NORTH BETHESDA includes WHITE FLINT, GROSVENOR, and TWINBROOK.*
3. *KENSINGTON/WHEATON includes WHEATON CBD.*
4. *SILVER SPRING/TAKOMA PARK includes SILVER SPRING CBD.*
5. *GERMANTOWN WEST includes GERMANTOWN TOWN CENTER.*
6. *column (A) jobs accessibility measures accessibility from policy area houses to regional jobs.*
7. *column (B) household accessibility measures accessibility from policy area jobs to regional houses.*
8. *column (C) composite accessibility is the average of these two values, weighted by households and jobs.*
9. *column (D) indexes the composite accessibility to a 0–1 scale.*
10. *column (E) shows Transit LOS.*
11. *column (F) auto mode share shows resident automobile mode share from the 1990 Census Update.*
12. *column (G) auto LOS shows the automobile LOS that results from this system*
13. *column (H) Current Standard shows current 6–Group auto LOS standard.*
14. *Transit mode share and auto mode share, added together, always equal 1. Transit mode share; then, is 1–auto mode share.*

Frequency

Frequency is a measure of how much transit service is on the road and rail network. A measure such as Transit Vehicle Miles per Hour per Street Mile is calculated with a high level of confidence since it depends only on the proper coding of the transit network in the TRAVEL/2 model. However, some issues arise.

- If frequency is used as a measure, transit lines with little ridership are as important as better-used transit lines.
- If the frequency measure depends only on vehicle miles, a train should be given more weight than a bus. (The average Metrorail train on the Red Line has six cars and between 68 to 80 seats per car; a Metrobus has on average 47 seats (and 25 standee places). Thus, a Metrorail train has about ten times as many seats as a bus. A MARC train, with five cars of 100 seats, is also about ten times the seated capacity of a bus.)
- Alternatively, if the frequency measure considers both the number of seats and vehicle miles, it would be necessary to know the exact fleet make-up on each bus route -- is the bus articulated, smaller, or larger than average? This detail would be difficult to track and forecast.
- As for the denominator of an average frequency measure (street/rail miles), another set of decisions would need to be made -- What set of street miles is to be used -- all streets in a policy area? only major highways and arterials? Should we multiply street miles by the number of lanes?

If a frequency measure were adopted instead of Regional Transit Accessibility, the Board would recommend using transit vehicle miles per hour with Metrorail and MARC trains being worth ten times bus miles. The Board would also recommend using only arterial and major highway centerline distances to measure street miles.

Advantages and Disadvantages of Accessibility and Frequency

	<i>Accessibility (Recommended)</i>	<i>Frequency</i>
Advantages	<p>Measures Usefulness of Transit System - Relates Transit to Land Use Patterns</p> <p>Considers all Non-Auto Modes in LOS Decisions</p> <p>Easily measured for CBD and Sector Plan Metro Stations</p>	<p>More Confidence in Measurement</p> <p>More Direct Relationship to CIP Programming</p>
Disadvantages	<p>More Abstract Calculation</p>	<p>Counts Empty Buses</p> <p>How it is Computed Changes Results</p> <p>Considers only Transit Modes in LOS</p> <p>Less Meaningful for Small Areas</p>

Component #4 Auto Level of Service

PATR currently uses the Average Congestion Index to measure auto level of service. The Average Congestion Index is defined as the volume-to-capacity ratio, weighted by vehicle miles of travel (VMT) on a scale ranging from A-F. In its AGP discussions in May 1993, the Planning Board agreed to continue to use this measure, either with or without counting freeways in the computation.

Given a single total transportation level of service standard (applicable to each area) and a policy area transit level of service, and mode shares for transit and auto, we can compute the acceptable automobile level of service under the new system. Table 2, column (G) gives a preliminary estimate of the resulting acceptable automobile level of service by policy area.

Let's continue with our example of Aspen Hill. Table 2, column (D) shows that the Regional Transit Accessibility index is 0.38, or LOS "B". Column (F) gives the Automobile Mode Share as 0.88, leaving a transit mode share of 0.12. Solving for the acceptable automobile LOS uses the equation for total transportation LOS described above:

$$TTLOS = (\text{Auto LOS} \times \text{Auto MS}) + (\text{Transit LOS} \times \text{Transit MS})$$

$$0.60 = (\text{Auto LOS} \times 0.88) + (0.38 \times 0.12)$$

$$\text{Auto LOS} = 0.63$$

Column (G) shows the proposed acceptable auto LOS (new standard) by policy area with a Total Transportation LOS and a Countywide Freeways Test. Column (I) shows our current standards, using the Six-Group definition. Generally, in areas where column (G) (new standard) is higher than column (I) (old standard), the new system would allow greater congestion, and therefore higher staging ceilings. However, all of the previous caveats concerning "upstream/downstream" effects, zoned holding capacity constraints, and policy considerations remain. Most areas have similar standards in the two systems.

Staging Ceilings

Table 1 (which followed the introduction) showed how the staging ceilings in the *Staff Draft FY95 AGP* would be altered if the proposed policy changes of a countywide freeways test and a total transportation LOS are implemented. This section summarizes the staging ceilings for the recommended approach and three other options:

- 1) Countywide Freeways Test and Total Transportation LOS
- 2) Countywide Freeways Test and "Six-Groups"
- 3) Current Freeways Test and Total Transportation LOS
- 4) No Freeways Test and "Six-Groups"

These are discussed in turn below:

1) Countywide Freeways Test and Total Transportation LOS

If the County adopts the Planning Board's recommendations to have a countywide freeways test and switch to a total transportation level of service, the resulting staging ceilings would depend on the selection of a total transportation level of service standard. The standard which staff suggests ("C-") results in the ceilings shown in Table 1.

Transportation staging ceilings even closer to those which were recommended in the *Staff Draft FY95 AGP* could be obtained by altering the auto LOS standard on local roads. This way, standards could be set which result in little overall change to gross staging ceilings county-

wide, although more severe changes to net remaining capacities within individual policy areas may result. That is, several more policy areas would enter moratorium.

The recommended approach adds 15,794 jobs and 18,631 houses of positive staging ceiling to the recommended FY95 staging ceilings developed using current procedures. However, part of the "additional" capacity relieves subdivision moratorium. The additional staging ceiling is equivalent to approximately eighteen months of growth for jobs and thirty-six months of growth for housing based on the final draft COG Round V Intermediate Forecasts, partially rectifying the job/housing imbalance found in the pipeline of approved development.

The staging ceiling increase is seen primarily in two types of policy areas. First, the staging ceilings in current Group II areas increase to reflect the higher total transportation level of service standard accepted in these areas. Congestion levels in these areas will still be lower than that accepted in current Group III areas. The additional staging ceiling in Group II areas was constrained somewhat by the "upstream/downstream" test, preventing other policy areas from entering moratorium. Second, housing staging ceilings in policy areas inside of the Beltway increase to estimated zoned holding capacity. These housing increases can be accommodated on local roads under the new standard and have a minimum impact on peak direction freeway traffic.

One systematic change is that Group II areas would have more allowable congestion than currently. This is because the transit mode share in Group II areas is small, indicating a low influence of transit level of service on total transportation LOS in these areas. In such policy areas, the auto standard becomes approximately equal to the overall standard because transit has little influence. Staff's observation is that when usage is considered along with transit availability, the difference between Group II and Group III is lessened. This, in turn, warrants their having a similar level of acceptable auto congestion.

2) Countywide Freeways Test and "Six-Groups"

Table 3 show the results of having a countywide freeways test, and current "Six-Group" standards applied only to local roads. While this does not result in as much additional staging ceiling as not counting freeways at all, there is still a significant increase. The countywide freeways standard assumed is LOS "D/E". The ceilings were developed using the minimization equation shown in end note 2.

Draft FY 95 Net Ceilings Under Current Policy Compared to

TABLE 3

Expected Ceilings Under Countywide Freeways Test and Six Transit Groups

HOUSING

Current Policy				Alternative Policy	
Policy Areas	Pipeline 9/30/93	FY 95 Draft Net Housing Ceiling	FY 95 Remaining Capacity C=B-A	Additional Ceiling	New Remaining Capacity E=C+D
January 1, 1993 Base					
Aspen Hill	2,439	(2,709)	(5,148)	0	(5,148)
Bethesda CBD	223	2,323	2,100	3,300	3,300
Bethesda/Chevy Chase	855	1,665	810	8,560	8,560
Cloverly	423	(1,286)	(1,709)	0	(1,709)
Damascus	343	(625)	(988)	0	(988)
Derwood/Shady Grove	95	1,474	1,379	0	1,379
Fairland/White Oak	1,290	(1,171)	(2,461)	0	(2,461)
Gaithersburg City	1,865	3,409	1,544	5,000	6,544
Germantown East	3,961	4,755	794	1,000	1,794
Germantown West	3,055	3,700	645	7,000	7,645
Germantown Town Center	138	1,902	1,764	0	1,764
Grosvonor	0	1,400	1,400	0	1,400
Kensington/Wheaton	616	7,449	6,833	0	6,833
Montgomery Village/Airpark	1,697	1,723	26	0	26
North Bethesda	358	2,109	1,751	0	1,751
North Potomac	1,327	(1,593)	(2,920)	0	(2,920)
Olney	1,892	2,412	520	0	520
Potomac	1,402	2,873	1,471	0	1,471
R & D Village	1,765	2,571	806	4,000	4,806
Rockville City	1,249	1,352	103	4,000	4,103
Silver Spring CBD	1,987	2,665	678	0	678
Silver Spring/Takoma Park	273	2,529	2,256	0	2,256
Twinbrook	0	300	300	1,200	1,500
Wheaton CBD	15	1,624	1,609	0	1,609
White Flint	751	1,700	949	2,000	2,949
Totals	28,019	49,935	27,738	36,550	64,388

EMPLOYMENT

Current Policy				Alternative Policy	
Policy Areas	Pipeline 9/30/93	FY 95 Draft Net Jobs Ceiling	FY 95 Remaining Capacity C=B-A	Additional Ceiling	New Remaining Capacity E=C+D
Aspen Hill	14	348	334	0	334
Bethesda CBD	1,679	6,984	5,305	0	5,305
Bethesda/Chevy Chase	2,638	5,847	3,209	2,000	5,209
Cloverly	30	(155)	(185)	0	(185)
Damascus	213	298	85	0	85
Derwood/Shady Grove	2,569	2,892	323	0	323
Fairland/White Oak	6,484	(1,547)	(8,031)	2,500	(5,531)
Gaithersburg City	18,358	18,412	54	7,500	7,554
Germantown East	15,004	15,380	376	1,500	1,876
Germantown West	9,353	10,663	1,310	10,500	11,810
Germantown Town Center	2,697	7,104	4,407	0	4,407
Grosvonor	0	0	0	0	0
Kensington/Wheaton	249	14,212	13,963	0	13,963
Montgomery Village/Airpark	5,734	2,713	(3,021)	0	(3,021)
North Bethesda	6,184	6,684	500	0	500
North Potomac	223	364	141	0	141
Olney	882	1,549	667	0	667
Potomac	113	2,273	2,160	0	2,160
R & D Village	6,123	9,516	3,393	9,000	12,393
Rockville City	21,515	9,641	(11,874)	10,000	(1,874)
Silver Spring CBD	8,914	9,477	563	0	563
Silver Spring/Takoma Park	887	1,524	637	0	637
Twinbrook	0	971	971	2,000	2,971
Wheaton CBD	115	3,778	3,663	0	3,663
White Flint	1,174	4,239	3,065	2,000	5,065
Totals	111,152	134,869	45,126	47,000	79,626

3) Current Freeways Test and Total Transportation LOS

The Planning Department performed preliminary analysis of the effects on transportation staging ceilings of a Total Transportation Level of Service without changing the rules for counting freeways. The standard for Total Transportation LOS in this test was "C/D". The effects (shown in Table 4) are significant -- approximately 13,500 additional households and 15,000 additional jobs would be added to staging ceilings spread throughout the County. These additions are largely in Group II areas, as Group II transit usage is low and transit LOS has little impact on overall LOS. Much of this staging ceiling increment addresses the moratorium in subdivision approvals.

Estimates of zoned holding capacity as well as "upstream-downstream" effects served as constraints. In addition, an attempt was made to keep changes modest, recognizing existing patterns of development. Given the choice between providing more positive capacity in one area and more negative in an adjacent area, or less positive and less negative, the latter option was selected. Council direction concerning jobs-housing balance was addressed, as was the instruction to relieve deficits in jobs or housing in a policy area before providing positive capacity of the other.

A level of service of "C/D" is the current auto standard for Group III areas (Derwood/Shady Grove, Gaithersburg, Aspen Hill, Fairland/White Oak). Auto congestion worse than "C/D" would be tolerated in areas with transit service better than that level, while areas with worse transit service would be required to have less auto congestion. In the current "six-group" system, only large changes in transit service result in changes to the levels of auto congestion considered acceptable. Using the current method of counting freeways, if a switch to a Total Transportation LOS is made, it is recommended that the standard for set at "C/D".

4) No Freeways Test and "Six-Groups"

Prior to developing alternative "freeway" scenarios, the Planning Department performed preliminary analysis of the effects of not counting freeways on transportation staging ceilings while maintaining our current auto level of service standards by policy area group. The effects are significant: approximately 60,000 additional housing units and 130,000 additional jobs would be added to staging ceiling throughout the County. In most policy areas the additional development capacity would consist of several thousand jobs and housing units. Planning staff emphasizes that these increases were the result of an estimation process which identified the land use that would meet the current area-wide (Six-Group) level of service standard calculated on only local roads.

**Draft FY 95 Net Ceilings Under Current Policy
Compared to
Expected Ceilings Under Current Freeways Test and Total Transportation Level of Service**

TABLE 4

HOUSING

January 1, 1993 Base	Current Policy			Alternative Policy	
	Pipeline 9/30/93	FY 95 Draft Net Housing Ceiling	FY 95 Remain- ing Capacity	Additional Ceiling	New Remain- ing Capacity
Policy Areas	A	B	C=B-A	D	E=C+D
Aspen Hill	2,439	(2,709)	(5,148)	991	(4,157)
Bethesda CBD	223	2,323	2,100	0	2,100
Bethesda/Chevy Chase	855	1,665	810	(6,000)	(5,190)
Cloverly	423	(1,286)	(1,709)	0	(1,709)
Damascus	343	(625)	(968)	1,185	217
Derwood/Shady Grove	95	1,474	1,379	0	1,379
Fairland/White Oak	1,290	(1,171)	(2,461)	0	(2,461)
Gaithersburg City	1,865	3,409	1,544	1,263	2,807
Germantown East	3,961	4,755	794	0	794
Germantown West	3,055	3,700	645	2,994	3,639
Germantown Town Center	138	1,902	1,764	0	1,764
Grosvenor	0	1,400	1,400	0	1,400
Kensington/Wheaton	616	7,449	6,833	0	6,833
Montgomery Village/Airpark	1,697	1,723	26	4,322	4,348
North Bethesda	358	2,109	1,751	0	1,751
North Potomac	1,327	(1,593)	(2,920)	5,033	2,113
Olney	1,892	2,412	520	2,300	2,820
Potomac	1,402	2,873	1,471	0	1,471
R & D Village	1,765	2,571	806	0	806
Rockville City	1,249	1,352	103	0	103
Silver Spring CBD	1,987	2,665	678	0	678
Silver Spring/Takoma Park	273	2,529	2,256	0	2,256
Twinbrook	0	300	300	0	300
Wheaton CBD	15	1,624	1,609	0	1,609
White Flint	751	1,700	949	0	949
Totals	28,019	49,935	27,738	12,088	40,137

EMPLOYMENT

January 1, 1993 Base	Current Policy			Alternative Policy	
	Pipeline 9/30/93	FY 95 Draft Net Jobs Ceiling	FY 95 Remain- ing Capacity	Additional Ceiling	New Remain- ing Capacity
Policy Areas	A	B	C=B-A	D	E=C+D
Aspen Hill	14	348	334	0	334
Bethesda CBD	1,679	6,984	5,305	0	5,305
Bethesda/Chevy Chase	2,638	5,847	3,209	(1,000)	2,209
Cloverly	30	(155)	(185)	0	(185)
Damascus	213	298	85	1,000	1,085
Derwood/Shady Grove	2,569	2,892	323	1,459	1,782
Fairland/White Oak	6,484	(1,547)	(8,031)	0	(8,031)
Gaithersburg City	18,358	18,412	54	3,924	3,978
Germantown East	15,004	15,380	376	0	376
Germantown West	9,353	10,663	1,310	3,601	4,911
Germantown Town Center	2,697	7,104	4,407	0	4,407
Grosvenor	0	0	0	0	0
Kensington/Wheaton	249	14,212	13,963	(500)	13,463
Montgomery Village/Airpark	5,734	2,713	(3,021)	4,590	1,569
North Bethesda	6,184	6,684	500	0	500
North Potomac	223	364	141	506	647
Olney	882	1,549	667	0	667
Potomac	113	2,273	2,160	0	2,160
R & D Village	6,123	9,516	3,393	1,566	4,959
Rockville City	21,515	9,641	(11,874)	0	(11,874)
Silver Spring CBD	8,914	9,477	563	0	563
Silver Spring/Takoma Park	887	1,524	637	0	637
Twinbrook	0	971	971	1,223	2,194
Wheaton CBD	115	3,778	3,663	0	3,663
White Flint	1,174	4,239	3,065	6,631	9,696
Totals	111,152	134,869	45,126	23,000	79,626

END NOTES

1. Equation for Option #1:

As an objective function, the equation for determining the optimality of a land use pattern under test (with option (1) or the current system) can be determined by solving for Z. By solving for a single value county-wide, the upstream and downstream effects of a land use pattern can be captured. A variety of land use patterns (an allocation of jobs and housing to a policy area) are tested by trial and error. The best land use pattern is the one which produced traffic volumes with the lowest value of Z:

$$\text{MIN } Z = \sum_{p=1}^P [(\text{STD} - \text{ACI}) \times \% \text{VMT}]$$

where: STD = policy area specific LOS standard
 ACI = anticipated Average Congestion Index
 %VMT = anticipated percent of county VMT in a policy area
 p = a policy area in set of all policy areas "P"
 Z = county-wide objective function value

subject to:

$$\sum_{p=1}^P [\% \text{VMT}] = 100\%$$

The key difference between the current system and option (1) is the set of links used in computing the Average Congestion Index and %VMT. The current system considers both local roads within a policy area and adjacent freeway sections, while option (1) considers only the local roads in a policy area and ignores the congestion on freeways.

2. Equation for Option #2

As an objective function, the equation for determining the optimality of a land use pattern under test with option #2 can be determined by solving for Z. This is similar to the method described in end-note 1, which accounts for upstream/downstream effects. Again, the best land use pattern is the one which produced traffic volumes with the lowest value of Z:

$$\text{MIN } Z = \sum_{p=1}^P [(\text{STD}(1) - \text{ACI}(1)) \times \% \text{VMT}(1)] \\ + [(\text{STD}(f) - \text{ACI}(f)) \times \% \text{VMT}(f)]$$

where: STD(1) = policy area specific local roads LOS standard
 STD(f) = county-wide freeways LOS standard
 ACI(1) = anticipated Average Congestion Index on local roads
 ACI(f) = anticipated ACI on freeways county-wide
 %VMT(1) = anticipated percent of county VMT on local roads
 in a policy area
 %VMT(f) = anticipated percent of county VMT on freeways
 county-wide
 p = a policy area in set of all policy areas "P"
 Z = county-wide objective function value

subject to: $\sum_{p=1}^P [\%VMT(1)] + \%VMT(f) = 100\%$

EXAMPLE: Suppose there were two policy areas "VICINITY" and "LOCALITY". VICINITY has a level of service standard on local roads of "C" (STD(1)= 0.55). LOCALITY has an LOS standard of "C/D" (STD(1)=0.66). County-wide, the LOS standard for freeways is set at "D/E" (STD(f)=0.88).

	TEST 1	TEST 2	TEST 3
VICINITY (ACI(1))	0.50	0.56	0.54
LOCALITY (ACI(1))	0.65	0.66	0.63
FREEWAYS (ACI(f))	0.90	0.91	0.89
VICINITY (%VMT(1))	13%	12%	13%
LOCALITY (%VMT(1))	20%	21%	21%
FREEWAYS (%VMT(f))	67%	67%	67%
Z	0.0049	0.0213	0.0009

On the first land use scenario (TEST 1), in VICINITY an anticipated Average Congestion Index of 0.50 was found, in LOCALITY it was 0.65. VMT in VICINITY in the peak hour was 13% of total VMT, in LOCALITY it was 20%. An anticipated ACI of 0.90 is found on freeways. Freeways have 67% of total VMT.

$$Z = | [(0.55 - 0.50) \times 13\%] \\ + [(0.66 - 0.65) \times 20\%] \\ + [(0.88 - 0.90) \times 67\%] |$$

$$Z = | - 0.0049 | = 0.0049$$

There was unused capacity on local roads in the first test, so additional staging ceiling was added for TEST 2. This resulted in better utilization of local roads, although slightly worse congestion on freeways. Overall, the Z

score was higher, so TEST 3, with less staging ceiling than TEST 2 was run. TEST 3 had lower congestion on the freeways and had the lowest Z score.

3. Equation for Option #3

Optimizing option (3) with two tests for each policy area will require using an equation similar to that presented in end note 1 to evaluate land use patterns county-wide (which will capture upstream and downstream effects):

$$\begin{aligned} \text{MIN } Z = & \sum_{p=1}^P [(\text{STD}(1) - \text{ACI}(1)) \times \% \text{VMT}(1)] \\ & + \sum_{q=1}^Q [(\text{STD}(f) - \text{ACI}(f)) \times \% \text{VMT}(f)] \end{aligned}$$

where:

- STD(1) = policy area specific local roads LOS standard
- STD(f) = policy area specific freeways LOS standard
- ACI(1) = anticipated Average Congestion Index on local roads
- ACI(f) = anticipated ACI on freeways in policy area
- %VMT(1) = percentage of county VMT in policy area on local roads
- %VMT(f) = percentage of county VMT in policy area on freeways
- p = policy area in set of policy areas P
- q = policy area in set of policy areas with freeways
- Z = value of objective function to minimize

$$\text{subject to: } \sum_{p=1}^P [\% \text{VMT}(1)] = 100\%$$

4. Equation for Option #4:

As an equation, the Composite Congestion to Standard Ratio is calculated as follows:

$$\text{CCSR} = \frac{\text{ACI}(1) \times \% \text{VMT}(1)}{\text{STD}(1)} + \frac{\text{ACI}(f) \times \% \text{VMT}(f)}{\text{STD}(f)}$$

where:

- CCSR = Composite Congestion to Standard Ratio
- %VMT(1) = percentage of policy area VMT on local roads
- %VMT(f) = percentage of policy area VMT on freeways
- ACI(1) = Average Congestion Index on local roads
- ACI(f) = Average Congestion Index on freeways
- STD(1) = policy area LOS Standard on local roads
- STD(f) = policy area LOS Standard on freeways

$$\%VMT(1) + \%VMT(f) = 100\%$$

Optimizing this alternative will require using an equation similar to that presented in end note 1 to evaluate land use patterns county-wide (which will capture upstream and downstream effects):

$$\text{MIN } Z = \sum_{p=1}^P [(1 - \text{CCSR}) \times \%VMT]$$

where: CCSR = Composite Congestion to Standard Ratio in policy area

%VMT = percentage of county VMT in policy area

p = policy area in set of policy areas P

Z = value of objective function to minimize

$$\text{subject to: } \sum_{p=1}^P [\%VMT] = 100\%$$

5. **Mode Shares:** Work-trip mode shares are used to calculate TTLOS. While non-work trips are a substantial proportion of all afternoon peak-period trips, many of those trips are linked to work trips, while others are simply not reported in conventional surveys. Staff has the highest level of confidence in our knowledge of work-trip mode shares at the residence end, which are regularly reported in the U.S. Census and MCPD Census-Update.

The mode shares to be used in the AGP would be forecast based on the land use and transportation network in place four years out (for instance for the FY 95 AGP, the forecast horizon year is 1998.) The TRAVEL/2 model mode choice component used here has been calibrated to the 1990 Census-Update Survey conducted by the Montgomery County Planning Department.

Table 2, column (F) shows composite automobile mode shares at the work and residence ends for policy areas in Montgomery County. Composite mode shares are the weighted average of mode shares of the residents and workers in an area.

6. **Regional Transit Accessibility:**

To calculate Regional Transit Accessibility, several equations are used:

$$\text{Accessibility from Houses to Jobs: } A_j = \sum_i [F_{ij} \times \text{EMPI}]$$

$$\text{Accessibility from Jobs to Houses: } A_i = \sum_j [F_{ij} \times \text{HH}_j]$$

where: A_j = Accessibility Index for zone j

Fij = Friction factor between zones i and j
EMPi = Employment in Origin Zone (i)
HHj = Households in Destination Zone (j)

For transit, the Friction factor (Fij) is as follows:

$$F_{ij} = \exp (-1.91 - 0.08 \times t_{ij} + 0.265 \times t_{ij} ^{0.5})$$

tij = travel time from Origin Zone (i) to Destination Zone (j) and ranges from 0-90 minutes. Travel times are estimated for the p.m. peak period using the TRAVEL/2 model.

LOCAL AREA TRANSPORTATION REVIEW

RECOMMENDATIONS FOR LOCAL AREA TRANSPORTATION REVIEW

Introduction

This document discusses the Planning Department staff's analysis and the Planning Board's recommendations on the issue of incorporating non-auto modes of travel into Local Area Transportation Review (LATR). The next section provides a brief background on this issue. Following that is a summary of the Board's recommendations, and then a more detailed discussion of each of the four broad areas of recommendations.

In short, the Board proposes four key recommendations. The first varies the congestion standard for LATR based on transit availability as is done in Policy Area Transportation Review. The second recommendation provides guidelines for requiring a safe and convenient pedestrian path between a proposed development and nearby activities. The third recommendation enables up to 10 percent of peak hour vehicle trips to be mitigated through the provision of enhancements to non-auto level of service. The last recommendation makes vehicle trip generation rates more sensitive to distance to Metro stations and transit orientation.

Background and Approach

Montgomery County uses Local Area Transportation Review (LATR) to determine the adequacy of transportation facilities in the immediate vicinity of a proposed development. Presently, if a development produces excessive local traffic congestion, the Planning Board must deny the proposed subdivision. The Annual Growth Policy, the Local Area Transportation Review Guidelines, and some area master plans provide detailed rules for making these determinations.

The FY94 Final Draft Annual Growth Policy (December 1992) contained a review of alternative methodologies for making LATR more sensitive to non-auto modes of travel. During discussions with the Planning Board and County Council, staff outlined the nucleus for the changes recommended here. For the FY95 AGP, the Planning Board was asked by the County Council to make recommendations concerning LATR. Specifically:

"The Planning Board should take the lead with the aid of the Executive in re-evaluating the Critical Lane Volume standards for Local Area Transportation Review, including the effect of varying the standard according to the extent which ridesharing, transit, and non-motorized transportation alternatives to the automobile are present."

Over the past four months, meetings on this topic have been held by Planning Department, Executive, and Council staff, consulting traffic engineers, and two interested citizens. In addition, a draft of these proposals was sent to members of the development community for comment.

A Planning Board worksession was held on March 17, 1994, at which the public was invited to speak. These recommendations are a product of those meetings and comments.

Summary of Recommendations

Making Local Area Transportation Review (LATR) sensitive to transit and pedestrians, as well as automobile traffic, can take several forms. The recommended approaches are discussed in detail in the following sections:

- A. *Varying Congestion Standards by Policy Area Transit Availability*
- B. *Establishing Adequacy for Pedestrian Transportation*
- C. *Enabling Flexibility by Transportation Enhancement Points*
- D. *Reflecting Mode Usage in Vehicle Trip Generation Rates*

These are summarized below:

- A. *Varying Congestion Standards by Policy Area Transit Availability*

The Planning Board recommends refining LATR congestion standards based on the transit availability in a policy area. This recommendation, compared to current congestion standards, would allow additional intersection congestion where increased transit alternatives are available, and would reduce the amount of permitted congestion in policy areas with minimal transit service. This approach is analogous to Policy Area Transportation Review, wherein congestion standards depend on transit availability and use in order to maintain an overall transportation level of service.

- B. *Establishing Adequacy for Pedestrian Transportation*

The Planning Board recommends requiring, where feasible, a safe and convenient pedestrian path between a new development and nearby activity locations. The activity centers (e.g. schools, libraries, parks, recreation, transit stops) considered are those within 1/4 mile of the edge of the site, well within walking distance.

- C. *Enabling Flexibility by Transportation Enhancement Points*

The Planning Board recommends permitting up to 10 percent of peak hour vehicle trips to be mitigated by provision of non-auto transportation enhancements. These enhancements are intended to improve the quality of service of non-auto

trips. This mechanism would provide flexibility for developers to meet the broad goal of adequate transportation facilities, particularly when the construction of intersection improvements is financially infeasible. In addition, it provides credit for sidewalk improvements required by the second recommendation.

D. *Reflecting Mode Usage in Vehicle Trip Generation Rates*

The Planning Board recommends adopting vehicle trip generation rate adjustment factors for multi-family residential sites within 1/2 mile of a Metro Station and for large retail sites within 1/4 mile of a Metro Station. In addition, for neighborhoods meeting site design criteria of being "Transit and Pedestrian Oriented," it is recommended to discount trips by 5 percent to account for lower work-trip vehicle trip rates. Currently, the only discount to trip generation for mode usage factors is for office buildings within 1,000 feet of a Metro Station. However, other land use categories are also expected to have somewhat lower vehicle trip generation rates when they are near, and oriented towards, transit. Moreover, this reinforces County policies of encouraging transit oriented development by reducing the necessary traffic mitigation from those sites.

In addition, over the next few months, the Planning Department will be preparing recommendations concerning technical adjustments to the critical lane volume method to improve its accuracy and reliability. These changes may include technical adjustments to "Lane Utilization Factors."

Detailed Recommendations

A. Varying Congestion Standards by Policy Area Transit Availability

This recommendation varies the Local Area Transportation Review (LATR) congestion standards to account for the transit availability found in a policy area. The standard is directly associated with the policy area as part of the Annual Growth Policy, and would be periodically reviewed as part of the AGP's "Policy Element." In this option, somewhat more intersection congestion would be acceptable in areas with greater transit availability; while less intersection congestion would be acceptable in areas with minimal transit availability.

The setting of a congestion standard is largely a policy judgment. It trades off the cost of congestion (borne by travelers) for the cost of improvement (borne largely by development). At volumes well below intersection capacity, the amount of delay is small. However, as volume approaches capacity, delay rises at a faster rate due to queueing. The highest CLVs observed in Montgomery County are on the order of 2000 CLV, which can be taken as capacity, or the maximum throughput volume in an hour. This number has risen over time due to improved signalization.

The proposal would tighten LATR congestion standards from 1525 to 1500 CLV in some current Group II areas with minimal transit availability. However, this change needs to be seen in context with other policy changes proposed for Policy Area Transportation Review, which increase staging ceiling and area-wide LOS standards in these same areas. Other changes discussed below also provide the opportunity to receive credit for non-auto transportation enhancements.

On the other hand, in current Group III, IV, and V areas, the congestion standard would be relaxed somewhat, permitting more traffic, to reflect the higher transit availability found in these areas. Consideration needs to be given to the increased difficulty in making intersection improvements in these areas. County policies encourage development in these transit serviceable areas with public infrastructure already in place; this change would help reinforce those county policies.

TABLE 5: RECOMMENDED LATR CONGESTION STANDARDS BY POLICY AREA

Current CLV Standard	Recommended CLV Standard	Policy Areas
1450	1450	Clarksburg Darnestown/Travilah Goshen Patuxent Poolesville/West County Upper Rock Creek
1525	1500	Cloverly Damascus North Potomac Olney
1525	1525	Germantown East Germantown Town Center Germantown West Montgomery Village/Airpark Potomac (*) R and D Village (*)
1525	1550	Aspen Hill Derwood/Shady Grove Fairland/White Oak
1525	1600	Kensington/Wheaton North Bethesda
1525	1650	Bethesda/Chevy Chase Silver Spring/Takoma Park
1800	1800	Bethesda CBD (*) Grosvenor Silver Spring CBD (*) Twinbrook Wheaton CBD White Flint

Note: Areas with asterisk () and Friendship Heights CBD have special LATR rules identified in their Master Plans or in the AGP. CLV stands for Critical Lane Volume.*

B. Establishing Adequacy for Pedestrian Transportation

While standards for roadway congestion have been set in Local Area Transportation Review (LATR), there are currently no standards or criteria to ensure adequacy of non-auto transportation at the local level, particularly to serve the mobility needs for the population below the legal driving age or without access to a car. This recommendation would complement the current Traffic Impact Analysis with a Pedestrian Impact Analysis as part of a more comprehensive Transportation Impact Statement. The subdivision ordinance as currently written permits this requirement:

Section 50-25 Preliminary Subdivision Plans - Approval Procedure.

- (n) *In approving a preliminary plan or site plan, the Planning Board may, with the concurrence of the County Department of Transportation and the Department of Environmental Protection, require construction by the developer of a reasonable amount of off-site sidewalks or sidewalk improvements. Off-site sidewalks or sidewalk improvements may be required to provide for one or more necessary connections from the proposed development to an existing sidewalk, existing or proposed bus or other transit stop, or public facility either existing or recommended in the adopted master plan for the area, that the Planning Board determines will be used by those in the development, or for handicapped access. The developer will not be responsible for acquisition of any right-of-way.*

In order to implement these recommendations, the Annual Growth Policy would have to identify a "public facility" for these purposes to include any of the following: affordable housing complex, public school, park, library, post office, government office, recreation center, shopping center, or significant office complex. For purposes here, activities are either existing, programmed for construction in the first 6 years of the Capital Improvement Program, or in the pipeline of approved development.

Recommended Guideline:

Determining Adequacy for Pedestrian Transportation

1. Standard

For residential development, pedestrian transportation shall be considered adequate when there is a safe and convenient path between the development and each of the following activities, located within about a 1/4 mile radius of the edge of the development:

- government facility (e.g. school, library, park, or post office),
- recreation center,
- retail center (# jobs > 20), or
- transit station or stop (rail or bus).

For non-residential development, pedestrian transportation shall be considered adequate when there is a safe and convenient path between the development and each of the following activities located within about a 1/4 mile radius of the edge of the development:

- affordable housing project as defined in Annual Growth Policy,
- government facility (e.g. school, library, park, or post office),
- medical/health care facility as defined in AGP
- retail center (# jobs > 20), or
- transit station or stop (rail or bus).

A "convenient path" is the shortest roadway network path (or a shorter paved and publicly dedicated off-roadway path) between the development and the activity under consideration.

A "safe path" is an all-weather path, such as a paved sidewalk or off-street bike path/trail when along the following classes of road:

- major highway,
- arterial,
- business district,
- industrial,
- any other street where anticipated peak hour volume (including existing conditions and the pipeline of approved development) exceeds 200 vehicles, or
- any street where lack of sidewalk poses a known safety hazard.

For a path to be considered safe, all road crossings shall be at intersections with crosswalks provided.

2. Mitigation

Lack of a safe and convenient path shall be mitigated by construction of an all-weather path, such as sidewalks or bike paths/trails where feasible and necessary. New sidewalks/paths constructed to fulfill this requirement shall be built to standard where possible and comply with the Americans with Disabilities Act. If the new construction is along an unbuilt Class I bike path/trail designated in the Master Plan of Bikeways, then that bike path/trail shall be constructed in lieu of a sidewalk.

3. Feasibility Considerations

As noted above, mitigation of inadequate pedestrian transportation shall only be required when "feasible."

- a) Construction is considered feasible if there is land in the public right-of-way or an easement has been granted. However, if the right-of-way or an easement is not available, the Pedestrian Impact Analysis shall still determine the location of needed sidewalks and/or bike paths.
- b) Pedestrian connections to activities separated by freeways, or other physical barriers, from the development are not subject to mitigation requirements under this provision.
- c) In order to limit the burden on any single development, the maximum amount of required off-site construction (or equivalent financial contribution) for any single development is 25 linear feet of sidewalk and bike path/trail per unit (dwelling unit or job).

This means that in general, the anticipated maximum cost at \$23 to \$35 per linear foot of sidewalk is \$575 to \$875 per unit. However, after review of submitted preliminary plans, the Planning Department believes that most sites will not require the maximum amount of sidewalk. Moreover, this construction can be utilized under the transportation enhancements option discussed below.

- d) This requirement is applicable only to developments which are considered "sufficiently sized" as defined in the Local Area Transportation Review Guidelines. This is currently defined as 50 or more trips.
- e) Roads which are scheduled to be constructed in the Capital Improvements Program may be assumed to have sidewalks or bike paths where feasible and would not require special developer contributions for this purpose.
- f) This requirement is not applicable in instances when the sidewalks could not be constructed without rebuilding the roadway as well.

C. Enabling Flexibility by Transportation Enhancement Points

In some cases meeting congestion standards is either not possible or is extremely costly. The Planning Board recommends that up to 10 percent of peak-hour vehicle trips generated, with a maximum of 50 trips, could be voluntarily mitigated through points earned by construction of non-auto transportation enhancements.

The following table shows how points would be earned:

TABLE 6: Transportation Enhancement Points Schedule

1 point per 140 linear feet of sidewalk/bike path
1 point per 1 bus shelter provided (including concrete pad)

One point is worth one peak-hour trip, which would not need to be counted in the traffic impact analysis. Collectively, enough points might substitute for an intersection improvement.

A maximum number of points per category for certain categories would be established. Credit would be given for only one bus shelter per bus stop, and only for bus stops within 1 mile of the development. The sidewalks which are constructed must be on a direct path between the site and a specific nearby activity (within 1 mile).

The Planning Department had recommended that projects be able to earn up to two points by providing bike lockers at activity centers (1 point per 8 two-bike-lockers). The Planning Board deleted the bike locker option, saying that the availability of sidewalks and bus shelters is more important to encouraging the use of non-auto modes of travel. They also noted that bike lockers would require someone to administer rentals as well as to perform maintenance, which would not be true of sidewalks and shelters.

Consideration of Adequacy of Pedestrian Transportation Requirement: It is recommended that sidewalks or bike paths constructed as part of the requirement for adequacy of pedestrian transportation be permitted to earn points as part of this transportation enhancement program.

Applicability to Staging Ceiling Flexibility: The Board recommends that that points earned in this process also be creditable towards reduction of peak-hour, peak-direction trips needed for staging ceiling flexibility. The Board further recommends that in no case shall more than 10 percent of the trips which need to be reduced for staging ceiling flexibility, with a maximum of 50 trips, come from this process.

Rationale for Points per Enhancement: The rationale for establishing the number of points per enhancement can turn on one of two factors: cost or benefit. Clearly establishing benefit (trips off road, quality of life, level of service for non-auto modes) is extremely difficult. For that reason, the equivalence described here is based on cost. At the low end, it costs about \$500 per year to mitigate one trip with an already existing share-a-ride program (e.g. Eastern Montgomery or Germantown), or for a twelve year program about \$5,000 per trip up-front in a letter

of credit. If points are given at a value approximately equal to the cost of trip mitigation (rather than benefit), then the cost of an enhancement should be about \$5,000 per point.

To further promote the construction of these transportation enhancements, the County Council could increase the points given (e.g., 1 point per 70 linear feet of sidewalk, 2 points per bus shelter). Alternatively, the cap of 10 percent of trips or 50 trips maximum could be adjusted.

TABLE 7: Approximate Costs for Transportation Enhancements

SIDEWALK ~ \$23 -> \$35 per l.f. or \$5000 per 140 -> 225 l.f.
BUS SHELTER ~ \$4,000/shelter

D. Reflecting Mode Usage in Vehicle Trip Generation Rates

Vehicle trip rate factors are derived from site specific studies in Montgomery County or using Institute of Transportation Engineers trip generation rates derived from studies across the country. These factors are averages, and do not consider all variables which may effect trip generation.

1. Distance to Transit Station

Current LATR procedures discount trip rates to reflect mode usage for office buildings within 1,000 feet (300 meters) of a Metro station. Other land use categories do not have such discounts in our current procedures, despite quantifiable differences in mode shares. JHK & Associates in the 1987 *Post-Metrorail Study*, confirming results found in a previous MWCOC study, found a correlation between transit mode share and distance from Metrorail for multi-family residential sites. Transit mode share, which is about 12 percent county-wide, was about 63 percent for sites on top of Metro stations.

The data can be used to develop a vehicle trip rate adjustment factor for multi-family residential land uses within 1/2 mile (2,640 feet or 800 meters) of a Metrorail station. The Planning Board recommends the following equation be used to account for the higher transit mode share of multi-family residential near Metro:

$$P = 2\% \times (2640 - D) / 100$$

where:

P = Percent reduction from total peak-hour trip ends
D = Airline distance to station in feet (0 -> 2640)

This recommendation is limited to multi-family housing because no data is available on single family homes (attached or detached) within 1/2 mile of transit stations. In addition, no data is available on the influence of Metro stations for a radius beyond 1/2 mile, although it is

expected to be small.

Similar work was performed for retail sites, and would result in the following trip rate adjustment factor for large retail sites (> 100,000 sq.ft.) within 1/4 mile (1,320 feet or 400 meters) of a Metrorail station. The Planning Board recommends the following equation be used to adjust vehicle trip rates for large retail sites near Metro:

$$P = 2\% \times (1320 - D) / 100$$

where:

P = Percent reduction from total peak hour trip ends

D = Airline distance to station in feet (0 -> 1320)

The available data could not be used to produce a quantifiable relationship between location near Metro stations and vehicle trip generation rates for small retail sites. In addition, no data suggests an effect for distances beyond 1/4 mile for large retail.

2. Neighborhood Design

The Montgomery County Planning Department's *Transit and Pedestrian Oriented Neighborhood Study* reviewed neighborhood design principles, showing how mode share can vary based on variation in site design/transit orientation between adjacent residential neighborhoods equidistant from transit lines. While it is clearly a thorny issue to try to dissect the factors influencing mode usage on a site or in a neighborhood, it seems logical that, all other things being equal, sites which are better oriented towards transit service (i.e. shorter walk times between houses and a transit stop) will have a higher transit mode share. A review of 3 neighborhood pairs (in each pair there was one transit oriented neighborhood and one non-oriented neighborhood) in Montgomery County showed that neighborhoods meeting the Department's criteria as being "transit and pedestrian oriented" had a 59 percent drive alone mode share, while the other paired neighborhood had a 71 percent share in the 1990 Census. The Planning Board therefore recommends a discount on vehicle trip generation (which includes both work and non-work trips) of up to 5 percent if the site meets a substantial portion of the criteria for a Transit and Pedestrian Oriented Neighborhood.

Criteria for Transit and Pedestrian Oriented Neighborhood

1. Transit Orientation and Walking Distance to Transit

- transit system (rail or bus) borders or traverses site
- transit lines within 1/2 mile have an effective frequency of one vehicle every 10 min., or better, in the peak hour.
- streets minimize walking distance to transit:
 - radial pattern of streets lead to transit station, or
 - linear ladder-like pattern of streets connect to bus stop
- residences are within 1/2 mile of rail, or 1/4 mile of bus

2. Pattern of Streets

- streets are interconnected (grid or curvilinear)
- through traffic located at perimeter of neighborhood
- small blocks with size from 180' to 300' in width
- building front on public streets, with garages to rear

3. Street Sections and Design Standards

- no hierarchy on secondary and tertiary residential streets
- customized streetscaping
- parallel parking on streets
- parking provided is minimum allowed in Zoning Ordinance
- 15' turning radii at neighborhood street intersections without transit, where allowed

4. Bicycle Systems

- bicycles share local streets with cars
- bicycle lockers at transit stops

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